Advanced Biomass Gasification Projects

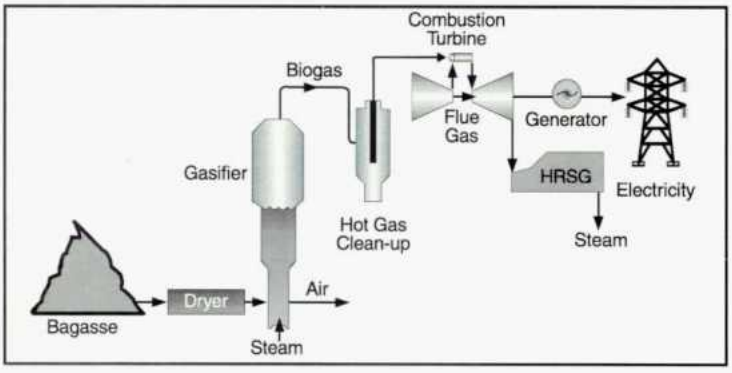
The U.S. Department of Energy (DOE) has a major initiative under way to demonstrate high-efficiency gasification systems for converting renewable biomass resources into electricity. The DOE Biomass Power Program is cost-sharing two gasification scale-up projects with industry: a 100-ton/day, high-pressure "direct" gasifier in Hawaii, and a 200-ton/day, "indirect" gasifier in Vermont that operates at atmospheric pressure.

Hawaii Gasifier Project

Project Summary

This project will provide a near-term demonstration integrating gasification and hot-gas cleanup (HGCU) components with gas turbines for power generation. The project is a 50/50 cost-shared effort that will significantly lower the perceived private-sector risk associated with the deployment of biomass gasification power systems, while producing electricity at cost-competitive rates.

The objective of the Hawaii project is to scale up the pilot 10-tons-per-day Institute of Gas Technology (IGT) Renugas® pressurized air/oxygen gasifier to an engineering development unit that can handle 100 tons per day of bagasse (sugarcane residue) as fuel. This demonstration project is located at the Hawaii Commercial and Sugar Company in Paia, Maui. Since this demonstration is at an existing sugar mill, it will provide access to the international sugar mill refurbishment market for this technology. The goal is to locate a suitable site for a commercial-scale power plant using this technology.



While this plant currently produces electricity from agricultural residues, it is designed to accept a wide variety of biomass feedstocks.

Project Status

The scale-up will be completed in several phases. The design, construction, and preliminary operation of the 50-100 tons-per-day gasifier has been completed, generating hot, unprocessed gas which was flared. During 1996, the gasifier was operated at a feed rate of 50 tons per day at a maximum pressure of 150 pounds per square inch absolute (psia). At the same time, the necessary design and environmental permitting was completed for slipstream operation

Warren Gretz, NREL/ PIX03793

This gasifier in Maui turns sugar cane residue into electricity, alleviating landfill or other waste management needs.

of the HGCU. In fiscal year (FY) 1997, a technology verification phase will be undertaken in which a new lock-hopper feed system and the filter assembly (the HGCU, developed by Westinghouse Electric Corporation (WEC) under contract to the National Renewable Energy Laboratory [NREL]) will be tested. The gasifier feed rate will be 100 tons per day and the system will operate at pressures up to 300 psia.

Partners and Cost Share

The following are all partners in the Hawaii Biomass Gasifier Project:

- Westinghouse Electric Corporation (WEC)
- Institute of Gas Technology (IGT)
- Pacific International Center for High Technology Research (PICHTR)
- Hawaii Natural Energy Institute (HNEI)
- Hawaii Commercial and Sugar Company (HC&S)
- State of Hawaii
- T.R. Miles Consulting Design Engineers
- Howard Engineering
- Ralph M. Parsons Company

Earlier stages of this project involved a cost-shared agreement lead by PICHTR. For the current phase of the project, lead by WEC, the proposed industry cost share for a 20-MW power plant will be 72%. This project also leverages investments made by DOE's Fossil Energy Program through their coal gasification research and development activities.

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The gasifier at the McNeil Power Generating Station in Burlington, Vermont, can handle up to 200 tons of wood wastes per day.

Vermont Gasifier Project

Project Summary

The Vermont Project has been undertaken to demonstrate the integration of the Battelle Columbus Laboratory (Battelle) "indirect" gasifier with a high-efficiency gas turbine. The demonstration and validation of this gasification/gas turbine system are being undertaken at the existing 50 megawatt (MW) wood-fired McNeil Power Generating Station in Burlington, Vermont, thereby significantly reducing the time scale for deployment and the necessary capital investment for DOE and the Vermont project partnership. The development and commercialization of this "indirect" gasifier technology is important because:

1) It does not require a hot-gas cleanup system for gas turbine operation, thus removing this technical hurdle from the commercialization path.

2) It produces a higher Btu gas stream than other gasification systems, thus allowing the use of existing unmodified industrial gas turbines.

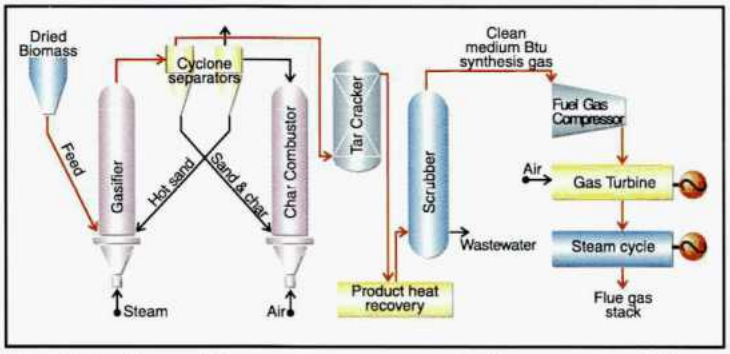
Demonstration of this U.S. technology at a utility power station will significantly lower the perceived risk among domestic and international power project developers. It will also provide significant market opportunities for advanced-cycle, high-efficiency biomass power generation systems for application in domestic and international markets. Successful demonstration will provide substantial market pull for U.S. biomass gasification technologies, and provide a significant market edge over competing foreign technologies.

Project Status

Construction is under way on a 200-tons-per-day "indirect" gasifier that will eventually be coupled with a 15-MW gas turbine to complement the existing 50-MW output of the McNeil Station. Zurn Nepco, an engineering company experienced in the design and construction of biomass-fired power plants, completed the detailed engineering design and began construction of the gasifier in March 1996; the permitting process was completed ahead of schedule in May 1996. In late 1997, initial operation and performance testing of the gasifier will begin. The addition of the 15-MW gas turbine is forecast for FY 1998.

Partners and Cost Share

The principal industrial partner, Future Energy Resources Company, of Atlanta, Georgia, is cost sharing 50% of the overall project costs with DOE. Other project participants include the co-owners of the McNeil generating station located in Burlington,Vermont, which is operated by the Burlington Electric Department; Battelle; and Zurn Nepco of Portland, Maine. The Vermont Project is a scale-up of an indirect gasifier concept developed by Battelle, which is based in Columbus, Ohio.



The Battelle gasifier system surrounds biomass particles with extremely hot sand, which converts them into gaseous form.

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